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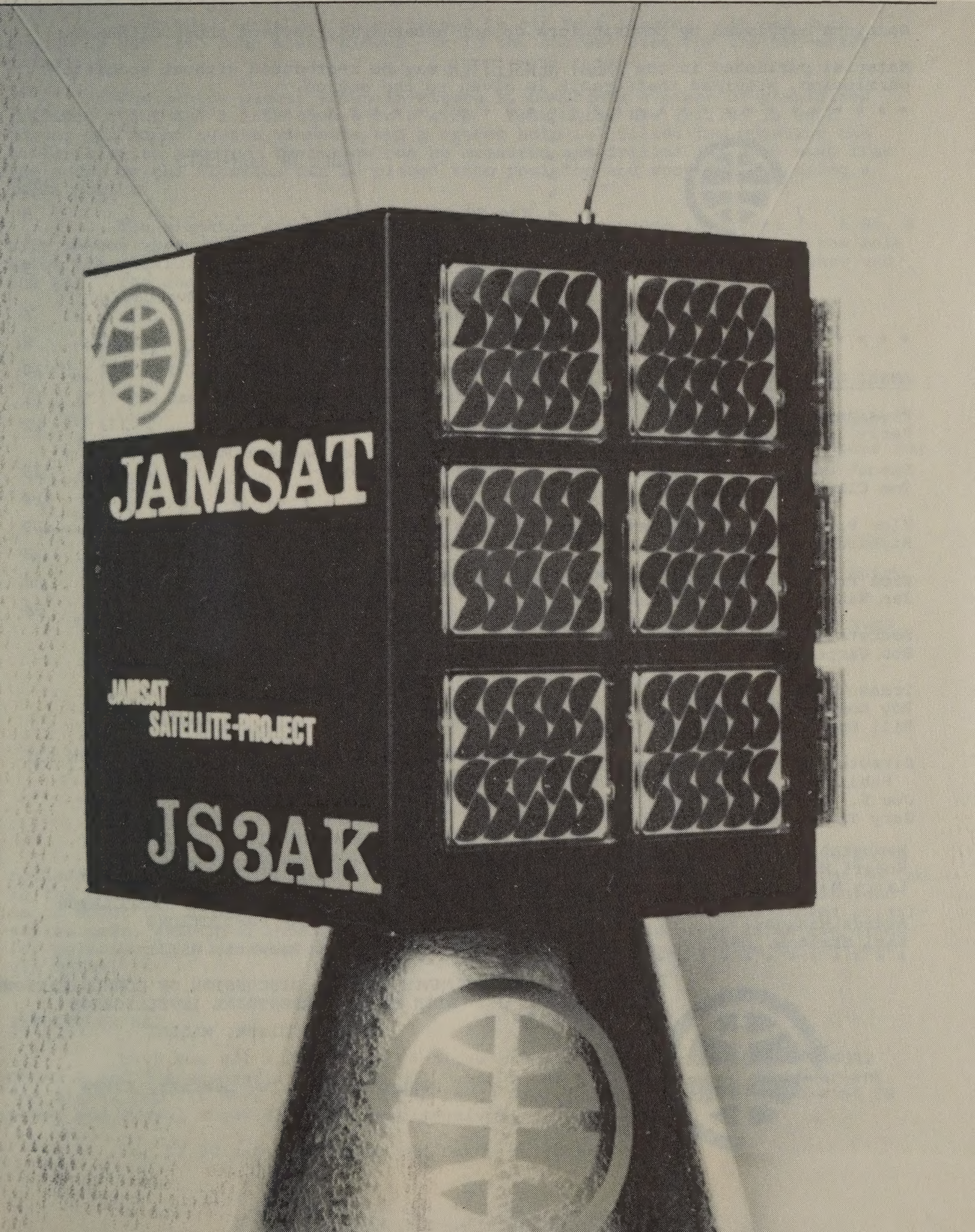

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Opinions expressed by contributors do not necessarily reflect those of AMSAT.

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9:30 a.m. 30 April 1977

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Dr. Tom Clark, WA3LND

Moderator: K. O. Learner, K9PVW

THE $2.00 TURNSTILE

BY JOE KASSER, G3ZCZ

This antenna is cheap and simple, is made out of aluminium angle and plexiglass, requires no special tools, and anyone can assemble it in less than 30 minutes.

The same basic design may be used for both 145 MHz and 432 MHz.

The dimensions of the elements and the matching sections are different for each band of course but the center section is the same.

Aluminum angle may be purchased in six foot lengths. If one such length is cut into four equal pieces, it is the correct size for the two-meter turnstile.

The center piece, shown in Figure 1, comprises a piece of plexiglass 1/4 inch thick and 1 inch square on a side. Four holes are drilled in each corner for mounting the elements and a center hole is drilled for mounting the whole thing to a mast. The holes can be measured and drilled 1/4 inch away from the sides or the elements can be placed into position and spot drilled using a drill press.

The elements are shown mounted to the center piece in Figure 2. A No. 4 bolt passes through the center piece and element. A washer is placed on the bolt below the plexiglass. A solder lug is placed on the bolt between the washer and the nut. The coax cable is soldered to the lug later.

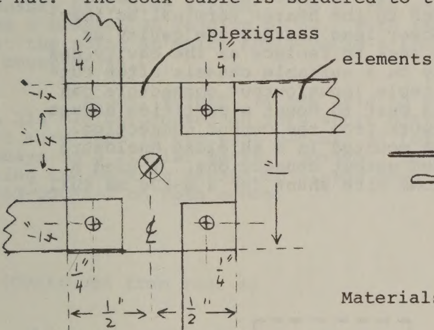


FIGURE 1

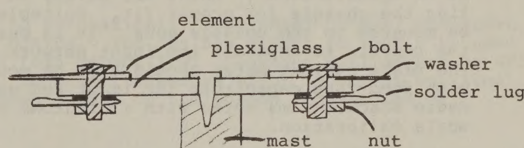


FIGURE 2

Materials: Plexiglass block, 1" sqqare, ¼" thick
¼" aluminum angle lengths
nuts, bolts, washers and solder lugs

Table 1. Dimensions for the Elements

Frequency	Element Length	0.221λ Spacing	Reflector Length
145.9 MHz	18"	not used	not used
432 MHz	5¼"	6 3/4"	6"

The 70 cm antenna is made in the same way but with shorter elements. A reflector element can be placed beneath the driven element. The antenna can be fed in any manner that you wish, for circular or linear polarisation. One technique is to mount the antenna facing North-South and feed each dipole in a linear polarisation mode, switching antennas as necessary. A second technique is to use circular polarisation, but that has to be changed when going from receive to transmit via OSCAR.

RESULTS IN USE

Both the 432 and 145 MHz versions have been used to access the AMSAT OSCAR 6 and 7 spacecraft. The 432 MHz version was fed with 8 W of CW power and 599 signal reports were received. The 145.9 MHz version was fed with 50 W of CW power and signal reports of 569 were received.

For $2.00 and 30 minutes you can't go wrong.

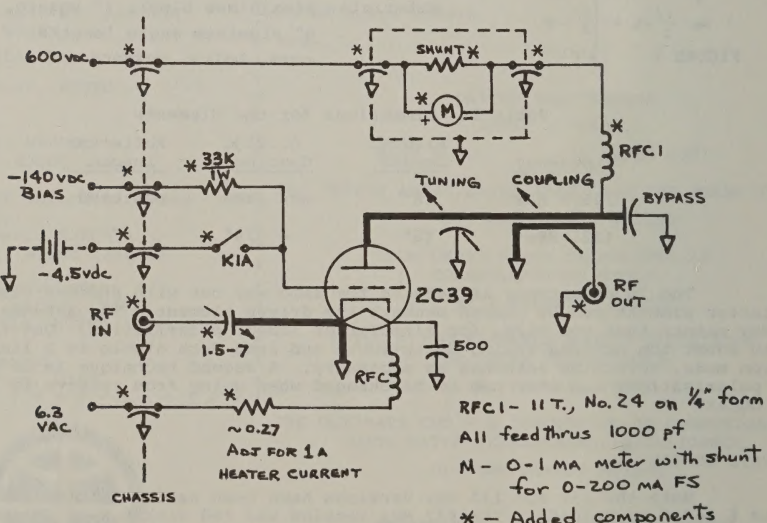
A 70-CM LINEAR AMPLIFIER FROM A MOTOROLA T44

BY WATSON R. GABRIEL, JR., WB4EXW

Many satellite users would like to have a low-power amplifier for 70 cm that, when used with a moderate-gain antenna, provides suitable ERP for Mode B use. The following description tells how to modify the final 2C39 cavity amplifier from a Motorola T44 450 MHz FM unit for linear service. While I am not the originator of the conversion, I thought it would be of interest to many present and future Mode B users.

To make the 2C39 amp operate in linear service, one has to use grid biasing instead of the usual cathode biasing for triode tubes as one end of the input inductive link which is tied to the 2C39 cathode is at DC ground. Remember that in the 2C39 this cathode connection is also tied to one side of the tube's heater. We will also add switching to cut the 2C39 off during receive periods, plate current metering, and heater current adjustment. One will also have to add a means of blowing air through the cavity for cooling the tube. I used an adapter made from a piece of fiberboard and a PVC pipe fitting so that the hose from my blower can be attached. Some friends have mounted small blowers directly to the end of the cavity enclosure. Air flow should be towards the output end of the cavity.

When removing the cavity from the T44, save the RFC and 500 pf metal-clad bypass capacitor that are attached to the heater terminal as they will be used. Also leave the plate power lead leaving the cavity as long as possible (it is a pain in the neck to replace as the cavity has to be disassembled). Mount the cavity on a suitable chassis after cutting the chassis for proper fit. Suitable input/output connectors can be mounted to the chassis ends. It is best to mount a partition across the chassis to separate the input network from the output connection. The plate current meter should also be mounted in a shielded enclosure with feed-thru capacitors for input and output connections. I used a Radio Shack 0-1 ma meter with a nichrome wire shunt for a 0-200 ma full scale calibration.



(Continued on Page 5)

AMSAT-OSCAR-6 BATTERY IN TROUBLE

BY RICHARD ZWIRKO, K1HTV

In early January it was noticed that a change for the worse in the condition of the battery of AMSAT-OSCAR-6 took place. Telemetry indicates that we are getting normal or slightly higher than normal counts on channel 3B (1/2 battery voltage) while at the same time the readings for channel 3A (V bus) are about 7 or 8 counts lower than expected. This indicates that one of the Ni-Cd cells in the upper half of the battery has failed. Because of this, it is believed that the battery will not charge at as great a rate as was possible before the failure. If the cell fails completely it will look like a diode during the time when current is being drawn from the battery and will look like an open circuit when the battery is in the charge mode. In its present condition the cell appears to be acting like a diode with a resistor in parallel with it, allowing the battery to be charged to some degree. How long this will last we don't know. Although only one cell appears to have gone bad, it is believed that other cells are close to being in the same condition and may also fail within the year.

Since AMSAT-OSCAR-6 is in total sunlight at this time battery heat is a problem. Telemetry channel 3D indicates that the battery temperature is in excess of 57°C. We do not want to further aggravate the thermal problem so the operation schedule for the satellite will remain the same. If the transponder is left off too much the temperature inside rises and if the bird is left on too much the battery voltage drops. I don't think the average AMSAT-OSCAR-6 satellite communicator realizes how much the AMSAT-OSCAR-6 command stations mean to the life of that particular bird. Without the millions of commands sent to it, AMSAT-OSCAR-6 would probably have died already. Up to the present time the red line cut off point has been a channel 3A reading of 52. With the failure of one cell it has been decided that the point at which AMSAT-OSCAR-6 should be immediately turned OFF will be a 3A count of 44.

Randy, VE3SAT, is now able to automatically load AMSAT-OSCAR-7 Codestore via his microprocessor on very short notice. You can now expect to hear C.S. used much more than in the past because of this capability. Messages will appear on GMT Sundays on a regular basis. However, important messages might appear at any time during the week if needed so please keep an ear on the beacon frequencies of AMSAT-OSCAR-7 on both modes.

(Continued from Page 4)

The parts with asterisks will have to be added. On my unit, the leads on the 1.5-7 pf input trimmer were long enough to reach from the input connector to the tuned cathode line. A short piece of No. 12 wire connects the RF output terminal to the output connector.

The biasing scheme used is very simple. When in receive mode, the tube is biased into cut-off by the -140 vdc line. During transmit, relay contact K1 closes and -4.5 vdc from a multi-tap battery becomes the grid bias voltage. This yields about 20 ma idling current in my 2C39 with 600 vdc on the plate. The contact closure can come from an external control relay or an internal relay as in my amp.

Tuning is simple. The sliding end of the plate line inside the cavity will have to be extended to bring the range of adjustment of the TUNING control into the 432 MHz area. After voltages have been applied and the heater current resistor set, apply a small amount of drive and tune for max as with any AB1 amplifier. Be sure to use a non-metallic tuning tool for adjusting the COUPLING control as the tuning tool shaft passes by the HV on the plate circuit. Follow recommended limits for the 2C39 as far as plate voltage and current are concerned.

Some fellow hams in this area have made two-stage amps by using both cavities from a T44. The first 2C39 cavity in a T44 is actually a tripler so a new input link must be made for this cavity as is used on the final amp. A two-stage amp works great when driven by a watt or two from a transmitting converter. My 70 cm setup includes a DJ6ZZ transmit converter followed by a DJ3SC 10 watt linear so I only use one 2C39 stage. Try it; works like a champ, even for passes on the horizon! To be honest, the 10 watts from the DJ3SC doesn't work bad by itself!

COST PERFORMANCE CRITERIA FOR EVALUATING PHASE III SATELLITES

BY MARTY DAVIDOFF, K2UBC/3

This paper evaluates the cost effectiveness of Phase III spacecraft by calculating the yearly cost per user. This is accomplished by (1) specifying the channel capacity of a linear transponder used for SSB and CW and (2) estimating the total number of users which a Phase III spacecraft can adequately serve.

CHANNEL CAPACITY

Channel capacity (the number of simultaneous conversations which a transponder can accommodate) can be estimated in the following manner. Assume that only SSB and CW will be used and that a SSB signal requires a 2.5 kHz bandwidth and that CW requires 0.5kHz. A 100 kHz transponder can accommodate 40 SSB channels or 200 CW channels or some combination of the two. A reasonable balance might be 62.5 kHz for SSB and 37.5 kHz for CW. This results in 100 channels (25 SSB and 75 CW) or an average of one channel per kHz. Using a different averaging method for the SSB and CW channels, such as the arithmetic mean (120) or the geometric mean (about 90), would only result in very minor changes in the following estimates.

MAXIMUM NUMBER OF USERS PER CHANNEL

Two methods for estimating the maximum number of users which a channel can support will be presented.

FM repeater clubs in the Washington, Baltimore area have demonstrated that single channel "open" repeaters supported by 200 members operate smoothly. Since not all users are members, the actual number of users per channel is in excess of 200. The conclusion is: single channel FM repeaters are capable of supporting in excess of 200 users per channel.

Now consider the HF bands (80-10 meters). In the U.S., 3.3 MHz are assigned to amateurs. In other parts of the world the total amateur bandwidth is somewhat less. However, the policy of this paper is to use conservative estimates, so the 3.3 MHz figure will be applied to all amateurs. Using previous assumptions, this is equivalent to 3,300 1-kHz channels. The world amateur population is approximately 800,000 (QST, Vol. LXI, No. 1, Jan. 1977, p. 55). Assuming that about 75 percent of these amateurs are licensed to operate in the HF bands yields a figure of 600,000 amateurs licensed to use 3,300 channels. This results in approximately 200 users per channel. At times, the HF bands are very crowded; however, they are usable. The conclusion is: an HF channel is capable of supporting approximately 200 users.

The preceding analysis suggests that a Phase III channel will probably be able to support about 200 users.

PHASE III USER CAPACITY

The data previously developed suggest that a 100 channel (100 kHz) transponder will be capable of serving up to 20,000 users before severe overcrowding becomes a problem. This assumes, of course, that users cooperate during peak load periods.

Since the Phase III user capacity is an extremely important parameter in this paper, the figure arrived at should be checked. Consider the situation where the number of users reaches the maximum capacity figure of 20,000. The satellite will be available about 170 hours per week. Assuming only two-way QSO's, 50 percent of time listening - 50 percent of time transmitting, this results in just under two hours of satellite time per user per week. Taking into account roundtables (nets) and the fact that even casual ragchewers spend more time listening than transmitting probably brings the average figure closer to three hours of satellite time per user per week. DX'ers, prefix hunters and state hunters normally spend a great percentage of their operating time listening. It's therefore conceivable that, even with the maximum of 200 users per channel, the average ragchewer will have 5 operating hours per week available. Since this is an average value, many users will no doubt be able to spend 8-10 hours per week operating through the satellite. While this number may seem small, remember that satellite operating time is only one aspect of amateur radio. Most amateurs will divide their time devoted to the hobby between HF operation, 2 meter FM, reading radio magazines, attending club meetings, constructing equipment, etc., as well as operating through satellites. Consequently the maximum capacity figure of 200 per channel appears reasonable.

It is interesting to speculate on the scenarios that may occur should crowding become a problem. One school of thought hypothesizes that users will switch from SSB to CW to increase the number of available channels. Another school of thought points out that a given amount of data can be transmitted much faster by SSB than by CW and that, when this time factor is taken into account, SSB is actually more efficient. However, this latter argument depends on users limiting themselves to essential information, a goal of questionable desirability. The purpose here is not to pursue these scenarios, or to discuss others which could produce similar results, but only to show that a number of options do exist should overcrowding become a problem.

COST ($) TO THE USER

Assuming a Phase III spacecraft cost of $200,000, a six-year lifetime, and 10,000 users (half capacity) results in a yearly cost per user of about $3.50. Even if only half of the actual users provide financial support to AMSAT, a yearly fee of $7.00 would adequately cover expenses. Using these conservative estimates, it would appear that the current AMSAT membership fee can provide the income needed to support a growing satellite program.

ADDITIONAL CONSIDERATIONS

It should also be noted that a number of factors should contribute to lowering the yearly cost per user for future Phase III spacecraft. The factors include (1) transponder improvements resulting in increased bandwidth, (2) solar cell research which should result in a big decrease in this significant expense, (3) launch opportunities which will not require that AMSAT provide an apogee kick motor on the spacecraft, eliminating this expense.

The cost effective analyses discussed in this paper can not be directly applied to Phase II (low-altitude) spacecraft, since the limited access time tends to concentrate users, requiring revision of the nominal channel capacity figure of 200 users per channel.

It's also of interest to compare the yearly cost per channel of the transponder to be included in the first Phase III spacecraft with "typical" ground-based two-meter FM repeaters. The previous assumptions (spacecraft = $200,000, transponder = 100 channels, lifetime = 6 years) yield a yearly cost per channel for the spacecraft of about $350.

The electric and telephone charges alone for the local Baltimore repeater (WR3AFM) equipped with telephone autopatch exceed $350 per year. It's very difficult to calculate "typical" capital costs of two-meter FM repeaters, but advertisements in amateur journals suggest that there is a market for commercial repeaters costing about $1,000. Repeaters using "surplus commercial strips" can also be expensive when the total costs, including 450 MHz links and commercial antennas, are taken into account. A very crude guess is that capital cost for the "average" two-meter FM repeater designed to accommodate a large number of users is about $2,000 prorated over 8 years. This results in a yearly cost of $250 for capital equipment. Electric bills easily raise the yearly cost to $350 and inclusion of autopatch facilities puts the repeater in the $500 per year category.

CONCLUSIONS

A 100 kHz Phase III satellite transponder can accommodate 20,000 users equipped for the uplink frequency. As a result, a Phase III program using current technology can be financially self-supporting through AMSAT membership fees once the first Phase III satellite is in orbit. The calculations may be regarded as conservative in that (1) the value assumed for satellite user capacity can easily be raised by increasing the percentage of CW or roundtable operation, (2) the number of actual users assumed for calculations (10,000) is only half the estimated capacity (20,000) and, (3) the number of users assumed to be supporting the program financially (5,000) is only half the actual users. The yearly cost per user per channel is expected to decrease for future Phase III spacecraft permitting a rapidly increasing Phase III program.

MINUTES OF THE AMSAT BOARD OF DIRECTOR'S MEETING
3 JANUARY 1977

The Board of Directors of the Radio Amateur Satellite Corporation (AMSAT) met in the Building 2 Conference Room, NASA/Goddard Space Flight Center, on 3 January 1977. The meeting was called to order at 8 p.m. by AMSAT President Perry Klein. The following persons attended:

AMSAT BOD members:

Perry Klein, W3PK
Thomas A. Clark, WA3LND
Jan King, W3GEY
William A. Tynan, W3XO
Charles Dorian, W3JPT

Others present:

Robert J. Carpenter, W3OTC
Marty Davidoff, K2UBC
Gary Tater, W3HUC
Charles Towns, K6LFH (Project OSCAR)
John Browning, W6SP (Project OSCAR)

After a short discussion, it was unanimously voted to affirm the recommendation of the Investment Committee and liquidate the holdings in the Dreyfus Liquid Assets Fund and place the funds in various bonds and bond mutual funds.

Since all funds, except for Life Membership reserves, are now authorised to be available for salaries, the Treasurer was authorised to operate with a single checking account.

There was a discussion of the telephone expenditures, now running about $200 a month. The Treasurer had suggested direct-dialing where the 60¢ overhead for operator intervention was significant. The substantial use of telephones is a result of the world-wide participation in the design, construction, and control of the AMSAT satellites.

Jan will attend the European Space Agency coordination meeting in Toulouse on 18 January 1977 to make necessary preparations for the launch of Phase III. While Jan's work takes him to Europe frequently, AMSAT will have to bear the direct costs of this trip. It was felt that DJ4ZC would probably come back to the U.S. with Jan on Jan's following trip to Europe. Up to $1000 was authorized for each trip to cover transportation, etc.

It was voted to continue AMSAT membership in The Middle Atlantic FM and Repeater Club (TMARC), which is the local FM coordination organization in view of AMSAT's operation of WR3ABU as a Washington-area liaison repeater. This annual expense, presently $20, was authorised until further notice.

WA3LND proposed that AMSAT record itself as favoring the creation of an ARRL VHF Advisory Committee, and to offer to participate. This was approved.

The AMSAT response to the FCC Third Notice of Inquiry in Docket 20271, Preparation for the World Administrative Radio Conference, was discussed. The proposed response was approved subject to the addition of thanks for the various satellite bands proposed. Tynan and Klein will modify the response appropriately so that it will be ready to hand out at the WARC preparatory meeting 25 January.

Klein reported on recent discussions with persons at the FCC. There seems to be strong feeling there toward opening all of 2 meters to repeater operation. Informal discussions were then undertaken toward the best approach to license the next spacecraft.

There was an extended discussion of possible future launch options. There seem to be a half-dozen in the next five years, but all would require early preparation and some are less sure than others. In view of our limited resources, most remain interesting "backup" possibilities.

The priorities at present are:

AO-D - Fall of 1977
Phase III on Ariane - December 1979
The SSUS-A and IUS on shuttle for second Phase III
Some sort of SYNCART - 1980 (synchronous satellite)

These priorities, which do not represent an immediate change, met with general approval.

Next there was a discussion of means for raising the funds necessary for Phase III. Clark pointed out four keys to funding:

increase membership numbers
solicit many small donations from hams
solicit several $1000 donations from hams
obtain large corporate donations

The main problem remains to find people to run the campaigns. Towns suggested that perhaps Project OSCAR should act as the organization to obtain the large donations. Davidoff presented an analysis showing that if Phase III is successful, we could expect 40,000 people to each donate $10 a year by about 1981!

In order to get large donations, Towns pointed out that we need a presentation suitable for a lawyer showing the need, the purpose, and the tax conditions. Clark observed that front-end money on the order of $10,000 would be required to start a campaign. Dorian questioned who would take on overall responsibility. The general consensus was that the AMSAT Board of Directors could not escape this responsibility. Tynan commented that AMSAT should raise a substantial sum from small donations to convince potential larger donors that there is wide support.

There was then a further discussion of details of money-raising techniques. It was decided that the Board of Directors MUST approve all fund-raising promotional material. It was voted to authorise AMSAT to pay for services needed in preparing promotional material.

The meeting adjourned at 12:25 a.m.

Respectfully submitted,

Robert J. Carpenter, W3OTC
Secretary

AMSAT GRATEFULLY ACKNOWLEDGES DONATIONS OF $100.00 OR MORE FROM THE FOLLOWING NEW LIFE MEMBERS:

LM-556 Alexander Schoening, DC7AS
LM-557 C. Mickey Hicks, WA6SZC
LM-558 Aubrey J. Hopkins, W6SO
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LM-589 Gardner K. Grout, WB6VEI
LM-590 T. Hammack, W4WLF

LMS-22 Rock Creek Amateur Radio Association, W3RCN
Silver Spring, MD

SOUTHERN HEMISPHERE EFFECT - A RESPONSE

BY JOHN FOX, WØLER

The following is in response to the numerous letters being received on what has become known as the Southern Hemisphere Effect.

AMSAT-OSCAR-7 is the first amateur radio satellite that has absolute control over all of its physical behavior: nutation damping (wobble), attitude control and spin or rotation control about the Z axis. The result of the aforementioned is a very stable spacecraft. The end result is a very predictable antenna orientation at a given instant at a given location with a given equatorial intercept.

The physical parameters of the hardware of AMSAT-OSCAR-7 are such that the 29 MHz antenna had to be mounted in the same plane as the attitude control magnet (the Z plane). The attitude control magnet reacts to the magnetic field of the Earth by sensing the North and South magnetic poles. This configuration produces a "Tip Null" a large percentage of the time for the 29 MHz downlink antenna. This will be most noticeable on passes that bring the spacecraft in or near zenith. For stations located in the northern hemisphere the ascending node passes from AOS to beyond TCA (sub-orbit point of 50° north latitude) will be quite weak. From this point to LOS the signal strength will increase. The same will be true for a descending node pass.

For stations located in the southern hemisphere, the south-bound node will be weakest from AOS to beyond TCA with signal level increasing from then till LOS. Again the same will be true for the north-bound node. The "Tip Null" effect can be best dealt with by using passes that are off to either side of the users by 1,000 miles (sub-orbit point) or better. One has to keep in mind that the 29 MHz antenna on OSCAR-7 is a linear antenna (dipole) and the radiation pattern will also be linear most of the time except for the effects of path propagation between the spacecraft and the receiving station. The ideal receiving antenna is a circular polarized antenna. At 29 MHz the physical size of a circular polarized antenna makes it prohibitive for most users.

The uplink antenna at 145 MHz should also be circular polarized. The input antenna on AMSAT-OSCAR-7 is circular polarized but is only circularized when the spacecraft is looking directly at you. Again this occurs only when the "Tip Null" is maximum or approaching maximum null. To eliminate the changing effects of the spacecraft's 145 MHz receiving antenna, a circular polarized transmitting antenna at the user's end is required for optimum fade-free contacts. This is especially true for the users of AMSAT-OSCAR-6.

All of the antennas on AMSAT-OSCAR-6 are linear. The 29 MHz antenna is mounted perpendicular to the attitude sensing magnet. This allows the 29 MHz antenna to rotate about the attitude plane. This is just the opposite of the configuration aboard AMSAT-OSCAR-7. This configuration of the 29 MHz antenna allows only three "Tip Null" fades per 360° rotation about the attitude stabilizing plane. The 145 MHz input antenna goes from horizontal to vertical or vice versa, especially on zenith passes. Without a circular polarized antenna for your up-link antenna at 145 MHz you will have to contend with fades both from attitude changes of the 29 MHz antenna and from the 145 MHz input antenna of AMSAT-OSCAR-6.

To summarize, the AMSAT-OSCAR-7 "Southern Hemisphere Effect" is probably the result of the "Tip Null" created by the 29 MHz antenna being mounted along the same axis as the stabilization magnets in A-O-7. The 29 MHz antenna on AMSAT-OSCAR 6 is mounted perpendicular to the stabilization magnet, and doesn't appear to exhibit this effect. All uplink antennas for both spacecraft should be circularly polarized.

AMSAT-OSCAR 7 COLOR PHOTOGRAPHS

If you do not live in the USA, you may obtain information about AMSAT from the following AMSAT representatives:

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(Continued on Page 13)

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WY			
PR			

AMSAT Area Coordinators are needed for the blank states indicated above. If you would like to volunteer to serve as an Area Coordinator, please contact Rich Zwirko, K1HTV, AMSAT Vice-President, Operations, 36 Sweet Birch Drive, Meriden, CT 06450.

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AMSAT Phase III

Radio Amateur Satellite Corporation

P.O. BOX 27, WASHINGTON, D.C. 20044

U. S. A.

HELP TO REVOLUTIONIZE AMATEUR RADIO COMMUNICATIONS

An exciting new phase in amateur radio is about to begin, one that will affect all of us. OSCAR satellites of the new AMSAT Phase III series will soon revolutionize long-distance amateur communications in the same manner that earth-bound repeaters have completely transformed local communications -- by dramatically increasing communications reliability while simultaneously reducing the cost and complexity of individual amateur stations. The first Phase III spacecraft, now scheduled for launch in 1979, will be available to most stations about 17 hours each day, and will make communications possible between stations separated by distances of up to 11,000 miles.

Amateurs interested in DX, rag chewing, contests and traffic handling will find Phase III satellites as easy to use as the whimsical ionosphere and their favorite band. AMSAT-Phase III spacecraft are being designed so that output powers of the order of 50 watts (CW or SSB) at 145 or 435 MHz and a small antenna resembling a TV antenna will usually outperform an HF band KW and tower-mounted beam. In effect, each satellite in the Phase III series will provide a new band with capabilities for worldwide contacts, usable by hundreds of amateurs at a time.

AMSAT-OSCAR's 6 and 7 have shown that long-lifetime amateur satellites are possible but, like all low-altitude satellites, they are greatly restricted in terms of range and access time, and they require accurate tracking. Phase III will eliminate these constraints.

But AMSAT needs your help to make Phase III a success. Hardware costs for the Phase III spacecraft are estimated at $200,000. (A government or commercial satellite providing similar performance would cost about $10,000,000.) While this figure may sound very large, once the system is operational the cost per user will actually be less than many of us are currently contributing to local repeater groups. In addition, individual users will find that their home station investment can be significantly decreased. With the rapid growth in amateur radio the question really is: Can we afford not to go ahead with the Phase III program?

What you can do to help:

1. Join AMSAT as a member for $10 per year in support of the amateur satellite program, or become a life member for $100.

2. Volunteer your services for engineering design, construction, fund-raising and other Phase III activities.

3. Sponsor a piece of the action by sponsoring part of the Phase III satellite. Sponsor one or more solar cells ($10 each), battery cell ($200), solar panel ($2,000), transponder ($5,000), onboard microcomputer ($8,000), or apogee rocket motor ($10,000). Donations are tax-deductible under Section 170 of the IRS code. Sponsors will receive a certificate suitable for framing, acknowledging their specific contribution. Contributors of $1,000 or more will have their names inscribed on a plaque included in the spacecraft orbiting around the earth.

Please send your contribution and membership dues to AMSAT, P. O. Box 27, Washington, D.C. 20044, U.S.A.

Invest in the future of Amateur Radio!

TO ALL MEMBERS: Photocopy this article and distribute it widely in your local area.

(Continued from Page 11)

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AMSAT-OSCAR 6

Ref Orbit	Date	Time (UTC)	Long W
19802	13 FEB	0031	67.0
19815	14 FEB	0126	80.8
19827	15 FEB	0026	65.8
19840	16 FEB	0120	79.5
19852	17 FEB	0020	64.5
19865	18 FEB	0115	78.3
19877	19 FEB	0015	63.3
19890	20 FEB	0110	77.0
19902	21 FEB	0010	62.0
19915	22 FEB	0105	75.8
19927	23 FEB	0005	60.8
19940	24 FEB	0100	74.5
19952	25 FEB	0000	59.5
19965	26 FEB	0055	73.3
19978	27 FEB	0150	87.0
19990	28 FEB	0050	72.0
20003	1 MAR	0145	85.8
20015	2 MAR	0045	70.8
20028	3 MAR	0139	84.5
20040	4 MAR	0039	69.5
20053	5 MAR	0134	83.3
20065	6 MAR	0034	68.3
20078	7 MAR	0129	82.0
20090	8 MAR	0029	67.0
20103	9 MAR	0124	80.3
20115	10 MAR	0024	65.8
20128	11 MAR	0119	79.5
20140	12 MAR	0019	64.5
20153	13 MAR	0114	78.3
20165	14 MAR	0014	63.3
20178	15 MAR	0109	77.0
20190	16 MAR	0009	62.0
20203	17 MAR	0103	75.8
20215	18 MAR	0003	60.8
20228	19 MAR	0058	74.5
20241	20 MAR	0153	88.3
20253	21 MAR	0053	73.3
20266	22 MAR	0148	87.0
20278	23 MAR	0048	72.0
20291	24 MAR	0143	85.5
20303	25 MAR	0043	70.8
20316	26 MAR	0138	84.5
20328	27 MAR	0038	69.5
20341	28 MAR	0133	83.3
20353	29 MAR	0033	68.3
20366	30 MAR	0128	82.0
20378	31 MAR	0027	67.0
20391	1 APR	0122	80.8
20403	2 APR	0022	65.8
20416	3 APR	0117	79.5
20428	4 APR	0017	64.5
20441	5 APR	0112	78.3
20453	6 APR	0012	63.3
20466	7 APR	0107	77.0
20478	8 APR	0007	62.0
20491	9 APR	0102	75.8
20503	10 APR	0002	60.8
20516	11 APR	1157	74.5
20529	12 APR	1252	88.3
20541	13 APR	0052	73.3
20554	14 APR	0147	87.0
20566	15 APR	0046	72.0
20579	16 APR	0141	85.8
20591	17 APR	0041	70.8
20604	18 APR	0136	84.5
20616	19 APR	0036	69.5
20629	20 APR	0131	83.3
20641	21 APR	0031	68.3
20654	22 APR	0126	82.0
20666	23 APR	0026	67.0
20679	24 APR	0121	80.8

AMSAT-OSCAR 7

Ref Orbit	Date	Time (UTC)	Long W
10277B	13 FEB	0030	59.9
10290A	14 FEB	0124	73.4
10302B	15 FEB	0023	58.3
10315X	16 FEB	0118	71.9
10327B	17 FEB	0017	56.7
10340A	18 FEB	0111	70.3
10352B	19 FEB	0011	55.1
10365A	20 FEB	0105	68.7
10377B	21 FEB	0004	53.5
10390A	22 FEB	0059	67.1
10403X	23 FEB	0153	80.7
10415A	24 FEB	0052	65.6
10428B	25 FEB	0146	79.1
10440A	26 FEB	0046	64.0
10453B	27 FEB	0140	77.6
10465A	28 FEB	0039	62.4
10478B	1 MAR	0134	76.0
10490X	2 MAR	0033	60.8
10503B	3 MAR	0127	74.4
10515A	4 MAR	0027	59.2
10528B	5 MAR	0121	72.8
10540A	6 MAR	0020	57.7
10553B	7 MAR	0115	71.2
10565A	8 MAR	0014	56.1
10578X	9 MAR	0108	69.7
10590A	10 MAR	0008	54.5
10603B	11 MAR	0102	68.1
10615A	12 MAR	0001	52.9
10628B	13 MAR	0055	66.5
10641A	14 MAR	0150	80.1
10653B	15 MAR	0049	64.9
10666X	16 MAR	0143	78.5
10678B	17 MAR	0043	63.4
10691A	18 MAR	0137	76.9
10703B	19 MAR	0036	61.8
10716A	20 MAR	0131	75.4
10728B	21 MAR	0030	60.2
10741A	22 MAR	0124	73.8
10753X	23 MAR	0024	58.6
10766A	24 MAR	0118	72.2
10778B	25 MAR	0017	57.1
10791A	26 MAR	0112	70.6
10803B	27 MAR	0011	55.5
10816A	28 MAR	0105	69.1
10828B	29 MAR	0005	53.9
10841X	30 MAR	0059	67.5
10854B	31 MAR	0153	81.1
10866A	1 APR	0052	65.9
10879B	2 APR	0147	79.5
10891A	3 APR	0046	64.3
10904B	4 APR	0140	77.9
10916A	5 APR	0040	62.8
10929X	6 APR	0134	76.3
10941A	7 APR	0033	61.2
10954B	8 APR	0128	74.8
10966A	9 APR	0027	59.6
10979B	10 APR	0121	73.2
10991A	11 APR	0021	58.0
11004B	12 APR	0115	71.6
11016X	13 APR	0014	56.5
11029B	14 APR	0108	70.0
11041A	15 APR	0008	54.9
11054B	16 APR	0102	68.5
11066A	17 APR	0001	53.3
11079B	18 APR	0056	66.9
11092A	19 APR	0150	80.5
11104X	20 APR	0049	65.3
11117A	21 APR	0144	78.9
11129B	22 APR	0043	63.7
11142A	23 APR	0137	77.3
11154B	24 APR	0037	62.2

AMSAT-OSCAR 6

Ref Orbit	Date	Time (UTC)	Long W
20691	25 APR	0021	65.8
20704	26 APR	0116	79.5
20716	27 APR	0016	64.6
20729	28 APR	0111	78.3
20741	29 APR	0010	63.3
20754	30 APR	0105	77.1
20766	1 MAY	0005	62.1
20779	2 MAY	0100	75.8
20791	3 MAY	0000	60.8
20804	4 MAY	0055	74.6
20817	5 MAY	0150	88.3
20829	6 MAY	0050	73.3
20842	7 MAY	0145	87.1
20854	8 MAY	0045	72.1
20867	9 MAY	0140	85.8
20879	10 MAY	0040	70.8
20892	11 MAY	0135	84.6
20904	12 MAY	0035	69.6
20917	13 MAY	0129	83.3
20929	14 MAY	0029	68.3
20942	15 MAY	0124	82.1
20954	16 MAY	0024	67.1
20967	17 MAY	0119	80.8
20979	18 MAY	0019	65.8
20992	19 MAY	0114	79.6
21004	20 MAY	0014	64.6
21027	21 MAY	0109	78.3
21029	22 MAY	0009	63.3
21042	23 MAY	0104	77.1
21054	24 MAY	0004	62.1
21067	25 MAY	0059	75.8
21080	26 MAY	0154	89.6
21092	27 MAY	0052	74.6
21105	28 MAY	0148	88.3
21117	29 MAY	0048	73.3
21130	30 MAY	0143	87.1
21142	31 MAY	0043	72.1
21155	1 JUN	0138	85.8
21167	2 JUN	0038	70.8
21180	3 JUN	0133	84.6
21192	4 JUN	0033	69.6
21205	5 JUN	0128	83.3
21217	6 JUN	0028	68.3
21230	7 JUN	0123	82.1
21242	8 JUN	0023	67.1
21255	9 JUN	0118	80.8
21267	10 JUN	0019	65.8
21280	11 JUN	0112	79.6
21292	12 JUN	0012	64.6
21305	13 JUN	0107	78.4
21317	14 JUN	0007	63.4
21330	15 JUN	0102	77.1
21342	16 JUN	0002	62.1
21355	17 JUN	0057	75.9
21368	18 JUN	0152	89.6
21380	19 JUN	0052	74.6
21393	20 JUN	0147	88.4
21405	21 JUN	0047	73.4
21418	22 JUN	0142	87.1
21430	23 JUN	0042	72.1
21443	24 JUN	0137	85.9
21455	25 JUN	0036	70.9
21468	26 JUN	0131	84.6
21480	27 JUN	0031	69.6
21493	28 JUN	0126	83.4
21505	29 JUN	0026	68.4
21518	30 JUN	0121	82.1
21530	1 JUL	0021	67.1
21543	2 JUL	0116	80.9

AMSAT-OSCAR 7

Ref Orbit	Date	Time (UTC)	Long W
11167A	25 APR	0131	75.7
11179B	26 APR	0030	60.6
11192X	27 APR	0125	74.2
11204B	28 APR	0024	59.0
11217A	29 APR	0118	72.6
11229B	30 APR	0017	57.4
11242A	1 MAY	0112	71.0
11254B	2 MAY	0011	55.9
11267A	3 MAY	0105	69.4
11279X	4 MAY	0005	54.3
11292A	5 MAY	0059	67.9
11305B	6 MAY	0153	81.5
11317A	7 MAY	0053	66.3
11330B	8 MAY	0147	79.9
11342A	9 MAY	0046	64.7
11355B	10 MAY	0141	78.3
11367X	11 MAY	0040	63.1
11380B	12 MAY	0134	76.7
11392A	13 MAY	0034	61.6
11405B	14 MAY	0128	75.2
11417A	15 MAY	0027	60.0
11430B	16 MAY	0121	73.6
11442A	17 MAY	0021	58.4
11455X	18 MAY	0115	72.0
11467A	19 MAY	0014	56.8
11480B	20 MAY	0109	70.4
11492A	21 MAY	0008	55.3
11505B	22 MAY	0102	68.9
11517A	23 MAY	0002	53.7
11530B	24 MAY	0056	67.3
11543X	25 MAY	0150	80.9
11555B	26 MAY	0050	65.7
11568A	27 MAY	0144	79.3
11580B	28 MAY	0043	64.1
11593A	29 MAY	0138	77.7
11605B	30 MAY	0037	62.6
11618A	31 MAY	0131	76.1
11630B	1 JUN	0030	61.0
11643B	2 JUN	0125	74.6
11655B	3 JUN	0024	59.4
11668A	4 JUN	0118	73.0
11680B	5 JUN	0018	57.8
11693A	6 JUN	0112	71.4
11705B	7 JUN	0011	56.3
11718X	8 JUN	0106	69.8
11730B	9 JUN	0005	54.7
11743A	10 JUN	0059	68.3
11756B	11 JUN	0154	81.9
11768A	12 JUN	0053	66.7
11781B	13 JUN	0147	80.3
11793A	14 JUN	0047	65.1
11806X	15 JUN	0141	78.7
11818A	16 JUN	0040	63.5
11831B	17 JUN	0134	77.1
11843A	18 JUN	0034	62.0
11856B	19 JUN	0128	75.6
11868A	20 JUN	0027	60.4
11881B	21 JUN	0122	74.0
11893X	22 JUN	0021	58.8
11906B	23 JUN	0115	72.4
11918A	24 JUN	0015	57.3
11931B	25 JUN	0109	70.8
11943B	26 JUN	0008	55.7
11956B	27 JUN	0103	69.3
11968A	28 JUN	0002	54.1
11981X	29 JUN	0056	67.7
11994A	30 JUN	0151	81.3
12006B	1 JUL	0050	66.1
12019A	2 JUL	0144	79.7

AMSAT-OSCAR 6

Ref Orbit	Date	Time (UTC)	Long W
21555	3 JUL	0016	65.9
21568	4 JUL	0111	79.6
21580	5 JUL	0011	64.6
21593	6 JUL	0106	78.4
21605	7 JUL	0006	63.4
21618	8 JUL	0101	77.1
21630	9 JUL	0001	62.1
21643	10 JUL	0055	75.9
21656	11 JUL	0150	89.6
21668	12 JUL	0050	74.7
21681	13 JUL	0145	88.4
21693	14 JUL	0045	73.4
21706	15 JUL	0140	87.2
21718	16 JUL	0040	72.2
21731	17 JUL	0135	85.9
21743	18 JUL	0035	70.9
21756	19 JUL	0130	84.7
21768	20 JUL	0030	69.7
21781	21 JUL	0125	83.4
21793	22 JUL	0025	68.4
21806	23 JUL	0120	82.2
21818	24 JUL	0019	67.2
21831	25 JUL	0114	80.9
21843	26 JUL	0014	65.9
21856	27 JUL	0109	79.9
21868	28 JUL	0009	64.7
21881	29 JUL	0104	78.4
21893	30 JUL	0004	63.4
21906	31 JUL	0059	77.2
21919	1 AUG	0154	90.9
21931	2 AUG	0054	75.9
21944	3 AUG	0149	89.7
21956	4 AUG	0049	74.7
21967	5 AUG	0144	88.4
21981	6 AUG	0044	73.5
21994	7 AUG	0138	87.2
22006	8 AUG	0038	72.2
22019	9 AUG	0133	86.0
22031	10 AUG	0033	71.0
22044	11 AUG	0128	84.7
22056	12 AUG	0028	69.7
22069	13 AUG	0123	83.5
22081	14 AUG	0023	68.5
22094	15 AUG	0118	82.2
22106	16 AUG	0018	67.2
22119	17 AUG	0113	81.0
22131	18 AUG	0013	66.0
22144	19 AUG	0108	79.7
22156	20 AUG	0008	64.7
22169	21 AUG	0102	78.5
22181	22 AUG	0002	63.5
22194	23 AUG	0057	77.2
22207	24 AUG	0152	91.0
22219	25 AUG	0052	76.0
22232	26 AUG	0147	89.7
22244	27 AUG	0047	74.7
22257	28 AUG	0142	88.5
22269	29 AUG	0042	73.5
22282	30 AUG	0137	87.3
22294	31 AUG	0037	72.3
22307	1 SEP	0132	86.0
22319	2 SEP	0032	71.0
22332	3 SEP	0127	84.8
22344	4 SEP	0027	69.8
22357	5 SEP	0121	83.5
22369	6 SEP	0021	68.5
22383	7 SEP	0116	82.3
22394	8 SEP	0016	67.3
22407	9 SEP	0111	81.0
22419	10 SEP	0011	66.0

AMSAT-OSCAR 7

Ref Orbit	Date	Time (UTC)	Long W
12031B	3 JUL	0043	64.5
12044A	4 JUL	0138	78.1
12056B	5 JUL	0037	63.0
12069X	6 JUL	0131	76.6
12081B	7 JUL	0031	61.4
12094A	8 JUL	0125	75.0
12106B	9 JUL	0024	59.8
12119A	10 JUL	0119	73.4
12131B	11 JUL	0018	58.3
12144A	12 JUL	0112	71.8
12156X	13 JUL	0012	56.7
12169A	14 JUL	0106	70.3
12181B	15 JUL	0005	55.1
12194A	16 JUL	0060	68.7
12207B	17 JUL	0154	82.3
12219A	18 JUL	0053	67.1
12232B	19 JUL	0147	80.7
12244X	20 JUL	0047	65.5
12257B	21 JUL	0141	79.1
12269A	22 JUL	0040	64.0
12282B	23 JUL	0135	77.6
12294A	24 JUL	0034	62.4
12307B	25 JUL	0128	76.0
12319A	26 JUL	0028	60.8
12332X	27 JUL	0122	74.4
12344A	28 JUL	0021	59.3
12357B	29 JUL	0116	72.8
12369A	30 JUL	0015	57.7
12382B	31 JUL	0109	71.3
12394A	1 AUG	0009	56.1
12407B	2 AUG	0103	69.7
12419X	3 AUG	0002	54.5
12432B	4 AUG	0056	68.1
12445A	5 AUG	0151	81.7
12457B	6 AUG	0050	66.5
12470A	7 AUG	0144	80.1
12482B	8 AUG	0044	65.0
12495A	9 AUG	0138	78.6
12507X	10 AUG	0037	63.4
12520A	11 AUG	0132	77.0
12532B	12 AUG	0031	61.8
12545A	13 AUG	0125	75.4
12557B	14 AUG	0025	60.3
12570B	15 AUG	0119	73.8
12582B	16 AUG	0018	58.7
12595B	17 AUG	0113	72.3
12607B	18 AUG	0012	57.1
12620A	19 AUG	0106	70.7
12632B	20 AUG	0006	55.5
12654A	21 AUG	0100	69.1
12658B	22 AUG	0154	82.7
12670A	23 AUG	0053	67.5
12683X	24 AUG	0148	81.1
12695A	25 AUG	0047	66.0
12708B	26 AUG	0141	79.6
12720A	27 AUG	0041	64.4
12733B	28 AUG	0135	78.0
12745A	29 AUG	0034	62.8
12758B	30 AUG	0129	76.4
12770X	31 AUG	0028	61.3
12783B	1 SEP	0122	74.8
12795A	2 SEP	0022	59.7
12808B	3 SEP	0116	73.3
12820A	4 SEP	0015	58.1
12833B	5 SEP	0109	71.7
12845A	6 SEP	0009	56.5
12858X	7 SEP	0103	70.1
12870A	8 SEP	0002	55.0
12883B	9 SEP	0057	68.6
12896A	10 SEP	0151	82.1

AMSAT-OSCAR 6

Ref Orbit	Date	Time (UTC)	Long W
22432	11 SEP	0106	79.8
22444	12 SEP	0006	64.8
22457	13 SEP	0101	78.5
22469	14 SEP	0001	63.5
22482	15 SEP	0056	77.3
22495	16 SEP	0151	91.0
22507	17 SEP	0051	76.1
22520	18 SEP	0146	89.8
22532	19 SEP	0045	74.8
22545	20 SEP	0140	88.6
22557	21 SEP	0040	73.6
22570	22 SEP	0135	87.3
22582	23 SEP	0035	72.3
22595	24 SEP	0130	86.1
22607	25 SEP	0030	71.1
22620	26 SEP	0125	84.8
22632	27 SEP	0025	69.8
22645	28 SEP	0120	83.6
22657	29 SEP	0020	68.6
22670	30 SEP	0115	82.3
22682	1 OCT	0015	67.3
22695	2 OCT	0110	81.1
22707	3 OCT	0009	66.1
22720	4 OCT	0104	79.8
22732	5 OCT	0004	64.9
22745	6 OCT	0059	78.6
22758	7 OCT	0154	92.4
22770	8 OCT	0054	77.4
22783	9 OCT	0149	91.1
22795	10 OCT	0049	76.1
22808	11 OCT	0144	89.9
22820	12 OCT	0044	74.9
22833	13 OCT	0139	88.6
22845	14 OCT	0039	73.6
22858	15 OCT	0134	87.4
22870	16 OCT	0034	72.4
22883	17 OCT	0128	86.1
22895	18 OCT	0028	71.1
32908	19 OCT	0123	84.9
22920	20 OCT	0023	69.9
22933	21 OCT	0118	83.6
22945	22 OCT	0018	68.7
22958	23 OCT	0113	82.4
22970	24 OCT	0013	67.4
22983	25 OCT	0108	81.2
22995	26 OCT	0008	66.2
23008	27 OCT	0103	79.9
23020	28 OCT	0003	64.9
23033	29 OCT	0058	78.7
23046	30 OCT	0153	92.4
23058	31 OCT	0053	77.4
23071	1 NOV	0147	91.2
23083	2 NOV	0047	76.2
23096	3 NOV	0142	89.9
23108	4 NOV	0042	74.9
23121	5 NOV	0137	88.7
23133	6 NOV	0037	73.7
23146	7 NOV	0132	87.5
23158	8 NOV	0032	72.5
23171	9 NOV	0127	86.2
23183	10 NOV	0027	71.2
23196	11 NOV	0122	85.0
23208	12 NOV	0022	70.0
23211	13 NOV	0017	83.7
23233	14 NOV	0017	68.7
23246	15 NOV	0111	82.5
23258	16 NOV	0011	67.5
23271	17 NOV	0106	81.2
23283	18 NOV	0006	66.2
23296	19 NOV	0101	80.0

AMSAT-OSCAR 7

Ref Orbit	Date	Time (UTC)	Long W
12908B	11 SEP	0050	67.0
12921A	12 SEP	0145	80.6
12933B	13 SEP	0044	65.4
12946X	14 SEP	0138	79.0
12958B	15 SEP	0038	63.8
12971A	16 SEP	0132	77.4
12983B	17 SEP	0031	62.3
12996A	18 SEP	0126	75.9
13008B	19 SEP	0025	60.7
13021A	20 SEP	0119	74.3
13033X	21 SEP	0019	59.1
13046A	22 SEP	0113	72.7
13058B	23 SEP	0012	57.6
13071A	24 SEP	0106	71.1
13083B	25 SEP	0006	56.0
13096A	26 SEP	0100	69.6
13109B	27 SEP	0154	83.2
13121X	28 SEP	0054	68.0
13134B	29 SEP	0148	81.6
13146A	30 SEP	0047	66.4
13159B	1 OCT	0142	80.0
13171A	2 OCT	0041	64.9
13184B	3 OCT	0135	78.4
13196A	4 OCT	0035	63.3
13209X	5 OCT	0129	76.9
13221A	6 OCT	0028	61.7
13234B	7 OCT	0122	75.3
13246A	8 OCT	0022	60.1
13259B	9 OCT	0116	73.7
13271A	10 OCT	0015	58.6
13284B	11 OCT	0110	72.2
13296X	12 OCT	0009	57.0
13309B	13 OCT	0103	70.6
13321A	14 OCT	0003	55.4
13334B	15 OCT	0057	69.0
13347A	16 OCT	0151	82.6
13359B	17 OCT	0051	67.5
13372A	18 OCT	0145	81.0
13384X	19 OCT	0044	65.9
13397A	20 OCT	0139	79.5
13409B	21 OCT	0038	64.3
13422A	22 OCT	0132	77.9
13434B	23 OCT	0032	62.7
13447A	24 OCT	0126	76.3
13459B	25 OCT	0025	61.2
13472X	26 OCT	0119	74.8
13484B	27 OCT	0019	59.6
13497A	28 OCT	0113	73.2
13509B	29 OCT	0012	58.0
13522A	30 OCT	0107	71.6
13534B	31 OCT	0006	56.5
13547A	1 NOV	0100	70.0
13560X	2 NOV	0155	83.6
13572A	3 NOV	0054	68.5
13585B	4 NOV	0148	82.1
13597A	5 NOV	0048	66.9
13610B	6 NOV	0142	80.5
13622A	7 NOV	0041	65.3
13635B	8 NOV	0136	78.9
13647X	9 NOV	0035	63.8
13660B	10 NOV	0129	77.3
13672A	11 NOV	0028	62.2
13685B	12 NOV	0123	75.8
13697A	13 NOV	0022	60.6
13710B	14 NOV	0116	74.2
13722A	15 NOV	0016	59.1
13735X	16 NOV	0110	72.6
13747A	17 NOV	0009	57.5
13760B	18 NOV	0104	71.1
13772A	19 NOV	0003	55.9

AMSAT-OSCAR 6

Ref Orbit	Date	Time (UTC)	Long W
23308	20 NOV	0001	65.0
23321	21 NOV	0056	78.7
23334	22 NOV	0151	92.5
23346	23 NOV	0051	77.5
23359	24 NOV	0146	91.3
23371	25 NOV	0046	76.3
23384	26 NOV	0141	90.0
23396	27 NOV	0040	75.0
23409	28 NOV	0136	88.8
23421	29 NOV	0035	73.8
23434	30 NOV	0130	87.5
23446	1 DEC	0030	72.5
23459	2 DEC	0125	86.3
23471	3 DEC	0025	71.3
23484	4 DEC	0120	85.0
23496	5 DEC	0020	70.0
23509	6 DEC	0115	83.8
23521	7 DEC	0015	68.8
23534	8 DEC	0110	82.6
23546	9 DEC	0010	67.6
23559	10 DEC	0105	81.3
23571	11 DEC	0005	66.3
23584	12 DEC	0060	80.1
23597	13 DEC	0154	93.8
23609	14 DEC	0054	78.8
23622	15 DEC	0149	92.6
23634	16 DEC	0049	77.6
23647	17 DEC	0144	91.3
23659	18 DEC	0044	76.3
23672	19 DEC	0139	90.1
23684	20 DEC	0039	75 1
23697	21 DEC	0134	88.9
23709	22 DEC	0034	73.9
23722	23 DEC	0129	87.6
23734	24 DEC	0029	72.6
23747	25 DEC	0124	86.4
23759	26 DEC	0024	71.4
23772	27 DEC	0119	85.1
23784	28 DEC	0018	70.1
23797	29 DEC	0113	83.9
23809	30 DEC	0013	68.9
23822	31 DEC	0108	82.6

AMSAT-OSCAR 7

Ref Orbit	Date	Time (UTC)	Long W
13785B	20 NOV	0057	69.5
13798A	21 NOV	0152	83.1
13810B	22 NOV	0051	67.9
13823X	23 NOV	0145	81.5
13835B	24 NOV	0045	66.4
13848A	25 NOV	0139	79.9
13860B	26 NOV	0038	64.8
13873A	27 NOV	0132	78.4
13885B	28 NOV	0032	63.2
13898A	29 NOV	0126	76.8
13910X	30 NOV	0025	61.7
13923A	1 DEC	0120	75.2
13935B	2 DEC	0019	60.1
13948A	3 DEC	0113	73.7
13960B	4 DEC	0013	58.5
13973A	5 DEC	0107	72.1
13985B	6 DEC	0006	56.9
13998X	7 DEC	0101	70.5
14010B	8 DEC	0000	55.4
14023A	9 DEC	0054	69.0
14036B	10 DEC	0149	82.5
14048A	11 DEC	0048	67.4
14061B	12 DEC	0142	81.0
14073A	13 DEC	0041	65.8
14086X	14 DEC	0136	79.4
14098A	15 DEC	0035	64.3
14111B	16 DEC	0129	77.8
14123A	17 DEC	0029	62.7
14136B	18 DEC	0123	76.3
14148A	19 DEC	0022	61.1
14161B	20 DEC	0117	74.7
14173X	21 DEC	0016	59.6
14186B	22 DEC	0110	73.1
14198A	23 DEC	0010	58.0
14211B	24 DEC	0104	71.6
14223A	25 DEC	0003	56.4
14236B	26 DEC	0058	70.0
14249A	27 DEC	0152	83.6
14261X	28 DEC	0051	68.4
14274A	29 DEC	0145	82.0
14286B	30 DEC	0045	66.9
14299A	31 DEC	0139	80.4

SPECIAL ORBITS OF AMSAT-OSCAR 6 AND AMSAT-OSCAR 7

ALL DAYS ARE UTC

A-O-6

Operational (145.9-146 to 29.45-29.55 MHz) on Northbound passes on Mondays, Thursdays and Saturdays.

During January and February, Wednesdays that fall on odd days of the year are reserved for special QRP tests; use a maximum of 10 watts erp.

Special intersatellite linking tests will be held Feb. 9 through Feb. 11 and Aug. 15 through Aug. 17-authorized users only.

Educational Bulletins are transmitted at 29.45 MHz on even numbered weekdays of the year on passes with equator crossings between 250 and 305 degrees west longitude.

A-O-7

Operational on Mode A (145.85-145.95 to 29.4-29.5 MHz) on odd days of the year, and on Mode B (432.125-432.175 to 145.975-145.925) on even days of the year.

Available for use every day except Wednesdays, which are reserved for educational uses.

Mondays that fall on even days of the year are reserved for QRP tests--use a maximum of 10 watts erp.

Special intersatellite linking tests will be run Feb. 9 through Feb. 11 and Aug. 15 through Aug. 17--authorized users only.

"LETTERS AND COMMENTS"

Dear Sirs,

I am a relatively new amateur having had my ticket for only eight months but since that time I have followed with great interest the activity on OSCAR 6 and to a lesser extent on OSCAR 7.

I purchased a two-meter rig in July and made some feeble attempts to attract other hams on OSCAR 6. This attempt was made from Yellowknife, NWT. In September I moved to Inuvik and thought my OSCAR days were over. I have a five-element beam set up on a rotating shaft <u>inside my shack</u> (I live in a metal-sided row housing unit) and using my Kenwood TS-700A have made more than 60 contacts in 12 states, 3 provinces, and 2 countries.

The farthest south I have contacted so far is Kentucky (talking to K4UQ twice). During one of the passes while I was in contact with Hawaii, I was told that the pass I was talking on was for telemetry purposes and not open for general use.

Well, I wish to operate properly and not step on toes especially with the satellites. I was not aware of the tracking orbits nor was I aware of the messages being broadcast on OSCAR 6. For these reasons plus I wish to give support to AMSAT I would like to take out membership for my station. Enclosed is a cheque for $6.00 which I was told is the membership fee, but if more is required please let me know and I will forward the balance. In addition, I would be pleased to assist you with any tests or information. From my limited experience I have found no one living this far north and participating in OSCAR.

For the majority of the pass I find myself talking to no one until the satellite travels far enough for me to hear Japan. So far I have talked to 13 JA's with reports ranging from 5-4 to 5-9. I was told that an amateur should not hit the satellite with 100 watts or more. I can't use that much power unless I co-phase two or more antennas but still keep getting 5-9 reports.

73

Roy J. Galloway, VE8TJ

Gentlemen:

First I would like to take this opportunity to thank you for your work with AMSAT. I don't believe people take your work for granted but they do often fail to express their appreciation.

If I may, I'd like to make some suggestions. Each of us has our own "bag" when it comes to amateur radio. Personally I'm an "appliance operator", an administrator, a certificate hunter, etc.

One thing I'd like to see is the expansion of the awards program. Some of this is suggested in consideration of OSCAR 8. Please remember, I'm not part of the administrative team so I have not heard pros or cons nor had the benefit of past "brain storming".

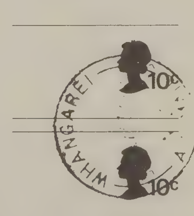
At any rate, why not increase the possibilities of the OSCAR beyond the 60 points? The 10 point steps are great but I believe we stop a little too soon for OSCAR 6 and 7 and definitely OSCAR 8. Maybe two horizontal certificates could be used, the first for OSCAR and the second for endorsements 30 thru 100. Oh, here's a point to consider. Maybe OSCAR should be unity with each sticker being 10. I have my stickers in each corner of the inside square of the certificate. The obvious question from a non-AMSAT member is, "What happened to 10 and 20?"

A second approach would be to add endorsements to the OSCAR sexagesimal award. The whole point is to offer a continuing challenge in obtainable steps.

Anyway, thanks, gentlemen. The technical aspects of OSCAR have been great. So has the operating. It's been your individual dedication that made it that way.

Sincerely,

Ed Macke, WB9RJQ



Dear Joe,

AMSAT-F can now be considered as a reality. I have found some people to help me and the French Association REF will participate. Here is the project of organization:

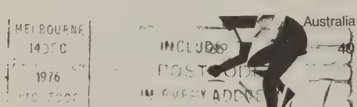
1. AMSAT-F is a club inside the REF and no dues will be asked to the members.

2. The REF will subscribe to AMSAT as Life-Member and one-half to one page will be reserved in the monthly review "Radio-REF" for AMSAT news. (This was begun in November 1976.)

3. For the beginning, the tasks will be shared between F1DOA, F1OK, and me. F1DOA is the mail manager and transmits the quarterly newsletter to French hams. He receives also SASE from the members so as to send urgent news before the printing of the review (new schedules, launches, special tests or Dx-peditions). F1OK is traffic manager and collects all information about the contacts, scores, etc., through the satellites. As for me, I ensure the liaison with AMSAT-USA, especially as far as new memberships or renewals are concerned. I can also help in the organization of exhibitions giving information about amateur satellites.

Hoping that we will now be able to help AMSAT from France, I send you my best 73's.

Gerard Francon, F6BEG



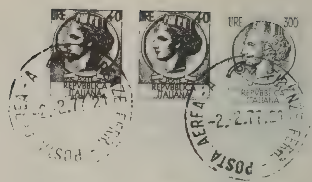
Hi,

I have been trying to work a few on OSCAR 7 but am crystal controlled at the bottom of the band. Should have a TS-700 here next week so will change all that. Have been trying to get some interest up here in Montana and have sent out 14 (to date) care packages consisting of the Getting Started in Satellites and copies of OSCAR schedules. Have W7TTC getting ready to go and he is using the info as a teaching tool in his math and science classes in the school in Joliet, Montana. W7OUX is getting set up to go. He is in Wyoming. Both of these will be Mode A.

Will be putting on demonstration for Ryegate High School science class in the near future. The instructor was a ham years ago and is now on CB. He is studying to get back on with the good guys. If any of the gang wants Montana, drop me a card and I can schedule most evenings except Monday and Tuesday. I can also usually catch the descending pass around 1400 in the mornings. I am negotiating for a Motorola 450 TX strip, and if I can get it, will try some Mode B. It may be summer before that takes place though. I listen to the nets but usually can't be heard on 20, but still get the info OK. I will drop you a note later and report on any new ones here in the Treasure State.

73,

Harry A. Roylance, W7RZY
P.O. Box 621
Harlowton, Montana 59036



Dear Joe,

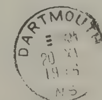
The long waiting QSO with South Africa has been made. LU4DYH from MAR DEL PLATA on the Atlantic Coast, worked ZS1BI South Africa (SSB) using OSCAR 7 Mode B at 22:05 GMT January 30, 1977. LU5DJZ was present in the shack. LU3AAT in Buenos Aires City briefly heard ZS1BI but is not sure if the ZS1 replied to his call. I listen from Mendoza 1,100 km away but heard nothing.

Argentine stations positively heard in QSO with OSCAR 7 Mode B:

LU3AAT - Buenos Aires City
LU4AEK - Buenos Aires City
LU9AEP - Buenos Aires City
LU1DAU - Buenos Aires State
LU6DCA - Buenos Aires State
LU5DJZ - Buenos Aires State
LU7DJZ - Buenos Aires State
LU6DRB - Buenos Aires State
LU7DXC - Buenos Aires State
LU4DYH - Buenos Aires State
LU7EEQ - Buenos Aires State
LU3EMH - Buenos Aires State
LU8MAJ - Mendoza State
LU1MBJ - Mendoza State
LU7MAS - Mendoza State
LU9MA - Mendoza State

73

Gene, LU9MA



Dear Joe:

This is the first letter I have ever written to an editor.

First, I want to say I have been a ham since Dec. 15, 1930 and have had many thrills and pleasures from ham radio, but I believe that the 455 complete QSOs thru OSCARs 6 and 7, A and B since May 26, 1975 have given me the most satisfaction.

Some of my experiences have been quite frustrating but all have been educational.

I really get a warm feeling hearing such great signals from W1JSM, K1HTV, W1FTX, W4AIT, WA4DYL, W6CG, and many others.

I extend my hearty congratulations to all of you who have done so much to make AMSAT a success.

73

Bob, W4AMI

Dear Perry:

I need some help from the AMSAT members to collect some data.

Another guy and myself are going to do some research into what effect the sun spots may have on our weather.

I have been very busy in amateur astronomy and we have received a grant for $10,000 to do some research on sun spots and weather. It appears that lots of work is being done in this area to see if sun spots do affect our weather.

I would like the following information from AMSAT members:

1. Information on Aurora such as date and time in GMT; length of Aurora; maximum distance worked; frequency used; if Aurora was heard on OSCAR signal, was Aurora seen visually; if so, how bright?
2. Information on weather the day following Aurora, such as type of clouds. Any newspaper clippings on weather in the area.
3. Any other information the members think I would use.

I would also very much like to hear from the members down in the South land who do not get Aurora very often. If I can get help from the AMSAT members this will aid us a great deal in our work.

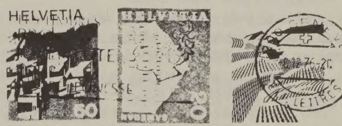
Every day we will take a sun spot count with a telescope we are setting up for solar work.

Your help will be appreciated.

Best of 73's,

Dave Robinson, K7BBO
1716 South 8th Street
Tacoma, WA 98405

P.S. This is a long term project so if members will send information whenever they get stuff we can use, we would be grateful.



Hi Guys,

Sorry I haven't been more active. I've expended a lot of time getting a Motorola 6800 system on the air. I know most of the "AMSAT MICRO'S" are 8080 oriented (or COSMAC) but if there are any members with 6800's, I'd be happy to exchange info with them.

<u>Configuration</u>

Hardware:
- 6800, 8K RAM "MICBUG", ASCII to Baudot converter, ASCII keyboard
- TV output device (not up yet)
- Hal Chamberlin's Audio Cassette Interface

Software: Tiny Basic
(Need good text editor/assembler)

Bill Bennett, K3TNM

Dear Perry,

Greetings from Florida. Are pretty well settled except for yard work and ham radio. Because of my wife's illness before we left Md, we did no sorting to speak of, just moved about everything, so we've been going through things which has taken time.

Sent the GE Prog-Line instructions which I found when I got here. Hope they arrived OK and will be useful to someone who uses my unit the organization loaned me.

Just received my Sept. AMSAT N/L and in reading the editorial saw I'd missed voting for Board members. My June AMSAT arrived during the height of Bettie's illness and was just tucked away and got buried in the move. Look forward to reading about what transpired at the meeting on the 23rd.

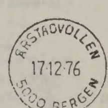
Since I came in under the old $50 LM time period, I'll send along another $50 now as I'm not sure when I might do it again.

Look forward to the final decision on what is to be put aboard the ITOS/ NOAA metsat. 15-to-10 would probably get a lot more activity since existing gear can be used. 145.9-to-435.1 should also get considerable activity since building a receiver converter is easier than a tx on 435. Must get busy right after the first of the year and build a pre-amp for 10 M and then a tx for the up-link.

The AMSAT Newsletter was a prod to get off my duff and at least let you know I enjoyed my activities, though minor, with AMSAT and hope to get involved again.

73 to you, Tom, Jan, Bill and Joe.

Ed Post, W3HKD/4



Dear Om:

After reading the last bulletin, I would favor the 4 orbits/day.

We need more articles on cheap equipment to get on OSCAR-7 A and B. I can't afford the elaborate $600-$700 rigs for two and could make kits.

Carl Yerian, W2AAV

Gentlemen:

Today I made my 1,000th QSO thru OSCAR 6 and OSCAR 7. No need to tell you that I enjoy the OSCAR program.

Many thanks.

R. M. Fuller, WØRWC

P.S. Since so many of us do not have 432 gear, hope this will be considered in future OSCAR planning.

Dear Joe,

First, thanks for the good info in the Newsletter. It has really helped this beginner get started in OSCAR work. I am presently running Mode A QRP with a 4 el. Cushcraft yagi and am not getting thru but am still trying. Later in the works will be a VFO, Varactor tripler to 432 and a transverter, in that order. Parts hunting is particularly troublesome down here but I generally am able to get thru a project albeit slowly! My present crystal puts (theoretically) the down-link sig on 29.510 . I am using a Vangard 10 M preamp and a HW101 or Yaesu FTdx401 for i.f.

My trouble is that I don't even know if my 4 el. yagi and 10 W CW will overcome the path loss. I realize that the QRP tests on Mode B proved the practicality of QRP there, but I don't have info on Mode A. Since I hear good sigs on down-link, I assume that it is my transmitting gear.

A listen to Mode B the other evening logged WA6ABN, WB5MEV, WA6UAB (UAP?), VE7AAZ, W7TYR(Oregon), WBØONS , W3AUE, WØIT, W5UB and others so that spurred me on to order parts for a 432 tripler. (Some of the listed calls may have been jotted down wrong.) But it sure shows that we have complete coverage of the W- and southern VE-regions.

But enough of this rambling; am enclosing my $10.00 dues to extend membership. As attached mailer indicates, my membership shouldn't be up until next December but will extend anyway.

Many thanks and 73 for the holidays,

Ron Sefton, ZF1SB

ERRATA

Antenna Beaming for an Eleven Hour Elliptical Polar Orbit

AMSAT Newsletter, December 1976

Page 5: Figure 1 shows the height in thousands of kilometres (not miles)

Page 11: Delete the parenthesis in equation (14)

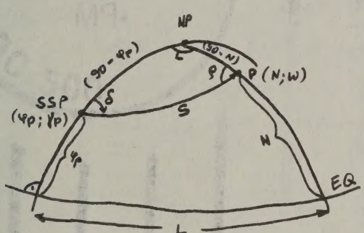
Page 12: Insert δ to the first row in the small table bottom left. δ is used as a step-by-step angle to determine the circle of the range.

L = arc cos (sin δ . sin φ . sin s - cos δ . cos φ).

The mistake was made when converting the originally used symbols to more redundand ones.

s is the angle of max. range for a given position of the satellite - originally φ was used.

Please forgive me.



NP = North Pole

s = max. range of the satellite when over SSP. The coordinates of SSP, and the height h (or the radius vector r=R+h) must be known.

δ = step by step angle to determine all points P

All readers are asked to excuse these errors.

Thanks to Joe (and the type setter) for their help and for this excellent reproduction. But it will be the last time I use Greek letters.

Otmar DL3SX

OSCARS

84	WB5MSU
85	WB4GZK
86	WB5MPU
87	WB9MRP
88	WB4HQE
89	WB9RJQ
90	W6DWJ
91	W5VAE
92	WA5DYH
93	W9JII
94	K7CC
95	W4EAT
96	K7GGY
97	P29MJ
98	W2HXF
99	OK1DAP
100	WA6WTX
101	W8UY
102	VE3GFM
103	K7NEQ
104	WA7VDY
105	W1JSM
106	W1DKU
107	SP9ADU
108	W4AIT
109	VE3EFX
110	WA8UUY
111	K7DYH
112	W6SO
113	W1DQJ
114	WB0BER
115	W2UZL
116	W3GK
117	G3ZCZ/W3

DL-ISSUED/DC9DX

D-05	DL6ZB
D-06	DL2OM
D-07	DK4HD
D-08	DC9ZP

F-ISSUED/F6BEG

F-01	F6BEG
F-02	F2NB
F-03	F6APU

UK-ISSUED/G8KLO

G-01	G4BBR
G-02	G4JJ

VK-ISSUED/VK5HI

VK01	VK5HI
VK02	VK5QR
VK03	VK5ZAD

* OSCAR AWARD *
UPDATES

OSCAR SEXAGESIMAL AWARD RECIPIENTS

1. WA7GCS
2. WA3LND
3. WA2CBB
4. VE5XU
5. OH2RK
6. VE3BNO
7. K2OVS
8. W4WSF
9. W6CG
10. W4GCB
11. W3BWU
12. K7VNU
13. W1JAA
14. W6ETJ
15. K9EIV
16. W6NZX
17. WA4LBO
18. OK3CDI
19. DK4QE
20. WØSL
21. W1JSM
22. WB4HQE
23. DJ2RE
24. WA3DMF
25. W4AIT
26. W6HEW
27. WB9RJQ
28. YV5ZZ
29. WA3THD
30. W1CRL
31. DJ1QT
32. W9OII

AMSAT NETS

The following AMSAT Nets meet regularly to disseminate information to newcomers and to keep regular satellite users in communcation with one another.

USA-East Coast Net	Wednesdays	0100 Z	3850kHz LSB	Net Control W3UN or WA3NA[illegible]
USA-Mid States Net	Wednesdays	0200 Z	3850kHz LSB	Net Control W[illegible]CY
USA-West Coast Net	Wednesdays	0300 Z	3850kHz LSB	Net Control W[illegible]DOW
JA-Net	Mondays	1300 Z	3555kHz LSB	Net Control JA1ANG
Asia-Pacific Net	Sundays	1100 Z	14,280kHz USB	Net Control JA1ANG
Western Europe Net	Sundays	1000 Local	3780kHz LSB	Net Control G3RWL
International Net	Sundays	1800 Z	14,280kHz USB	Net Control W3ZM or W3UN
	Sundays	1900 Z	21,280kHz USB	Net Control W3ZM or W3UN
Africa-Europe Net	Sundays	1700 Z	14,280kHz USB	Net Control G3IOR
	Saturdays	1000 Z	14,280kHz USB	Net Control G3IOR
Africa Nèt	Saturdays	1100 Z	14,280kHz USB	Net Control TU[illegible]EF
	Saturdays	1130 Z	21,280kHz USB	Net Control TU[illegible]F

The following vhf frequencies are also in use:

London, England	144.28MHz USB	Net Control G8CSI	Sundays	1930 Local
Atlanta, Georgia	145.80MHz USB/CW	Net Control WA4DDH	Sundays	2000 Local
Washington, D.C.	146.25-85MHz FM	Net Control W3UN	Wednesdays	0200Z
Los Angeles, Calif.	146.25-85MHz FM	Net Control W6CG	Daily	

Bulletins of general interest to those interested in amateur satellites are transmitted regularly on OSCAR-6 reference orbits, at approximately 10 minutes after Ascending Node. These bulletins are transmitted on a downlink frequency of approximately 29,490 kHz and can be received over most of Eastern North America.

Educational bulletins are transmitted regularly by AMSAT Educational Bulletin Stations in North America on even numbered weekdays of the year via the AMSAT-OSCAR 6 two-to-ten meter transponder. These bulletins, addressed to schools, can be heard on 29.50 MHz during morning passes having equatorial crossings between 250 and 305 degrees W. Longitude.

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